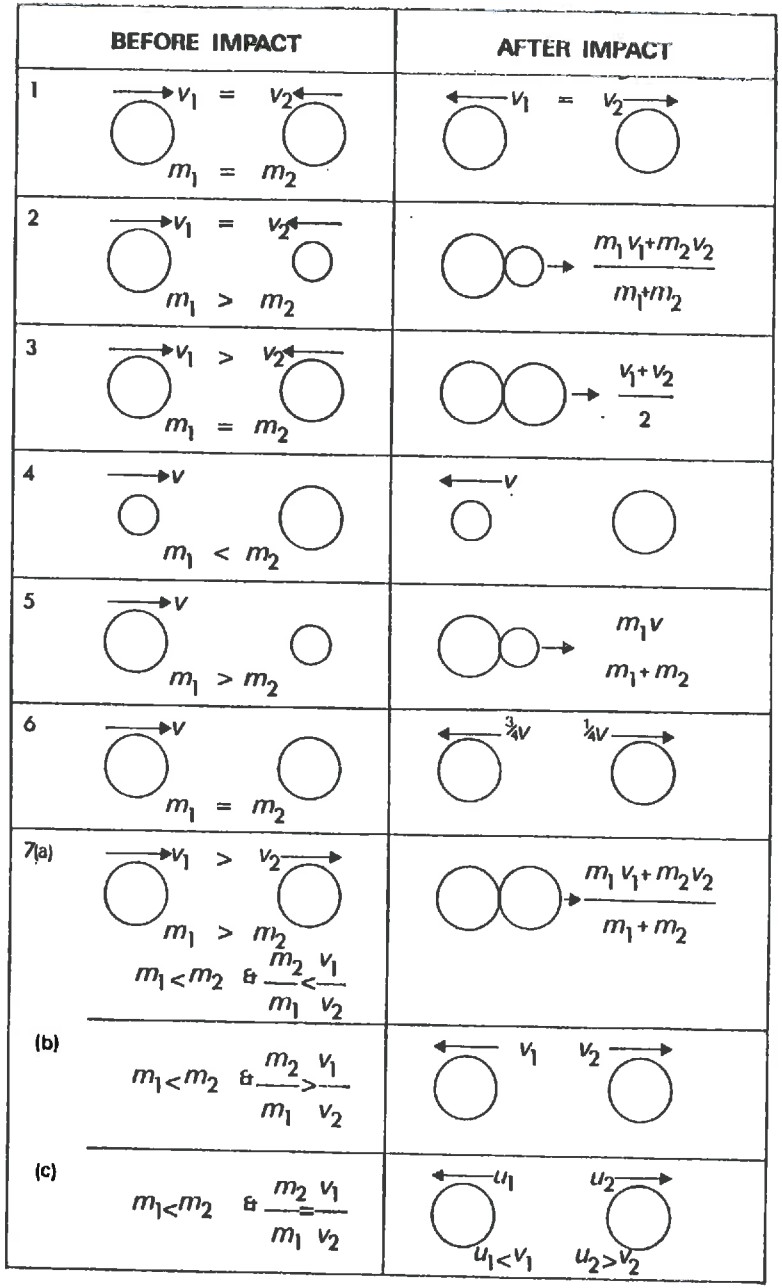

Yet that cannot be the whole story. We have already seen that the two-fold contrariety is not mentioned in art 45, which would have formed part of the hypothetical original draft of the *Principia*, nor is it mentioned in the expanded and re-written French versions of arts 45–52, where Descartes could have taken the opportunity to explain its involvement in the collision rules.[146] And yet we know that the two-fold contrariety model is in operation in the Seven Rules, since the letter to Clerselier of 17 February 1645 makes the matter as clear as it could be. At the same time, and as a surprising bonus, the passage in question allows us to suspect that Descartes had unspoken philosophical motives for withholding from the learned public such an apparently fundamental part of his mature theory of collision:

> . . . I am pleased to see that the first and principal difficulty you have found in my Principles concerns the rules according to which the motion of colliding bodies changes. For that leads me to think that you found none in what precedes them and that also you will not find much difficulty in the rest, nor in these rules either if you bear in mind that they depend on only a single principle, which is that *when two bodies collide and have in them incompatible modes [des modes incompatibles], unquestionably there must occur some mutation*[147] *of these modes to make them compatible, but this mutation is always the least possible.* That is, *if they can become compatible through the mutation of a certain quantity of these modes, a greater quantity will not undergo mutation.* And it must be noted that there are in motion [*mouvement*] two different modes: one is the motion [*motion*] alone, or the speed, and the other is the determination of this motion [*motion*] in a certain direction. Of these two modes, one changes with as much difficulty as the other.
>
> So to understand the fourth, fifth, and sixth rules, in which B's motion and C's rest are incompatible, it must be carefully noted that they can become compatible in two ways: that is, *if the whole determination of B's motion undergoes mutation*, or, *if B effects a mutation in C's rest, transferring to it a part of its motion such that it can push it before it as fast as it itself moves.* And in these three rules I have said nothing other than this: when C is larger than B, it is the first of these two ways that obtains; when it is smaller, it is the second way; and finally when they are equal, the mutation is made half by one, half by the other. For when C is the larger, B cannot push it before it except it transfer to it more than half of its speed, and at the same time more than half of its determination to go from right to left, seeing that this determination is joined to its speed. Whereas, rebounding without moving C, only the whole of B's determination undergoes mutation, which is a smaller mutation than that which would be made up of more than half of the same determination and more than half of the speed. If on the contrary C is less than B, it must be pushed by it, for then B gives it less than half of its speed, and less than half of the determination which is joined to it, which makes up less than the whole of the determination, which would have to undergo mutation if it rebounded.[148]